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Impact of Hospital Care Environment on Patient Mortality and Nurse Well-being

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Abstract

Objective: This study aimed to investigate the comprehensive impacts of nurse practice environments on both nurse and patient outcomes, while considering the influence of nurse staffing and education.

Background: While the associations between staffing, education, and patient outcomes are well-established, research on the impact of care environments on outcomes has been relatively limited.

Methods: Data from 10,184 nurses and 232,342 surgical patients ش were examined. Care environments were assessed using the practice environment scales of the Nursing Work Index. Outcomes included nurse job satisfaction, burnout, intent to leave, perceptions of care quality, as well as patient mortality and failure to rescue.

Results: Nurses reported higher job satisfaction and fewer concerns regarding care quality, while patients exhibited significantly reduced risks of mortality and failure to rescue in hospitals with better care environments.

Conclusion: Optimizing care environment factors alongside nurse staffing and education is crucial for achieving high-quality care.

Introduction

A recent systematic review commissioned by the Agency for Healthcare Research and Quality (AHRQ) highlighted a robust body of evidence linking nurse staffing levels to improved patient outcomes in hospitals. Additionally, several large-scale studies have demonstrated that hospitals with better-educated nursing staffs tend to exhibit lower patient mortality rates. Moreover, research on magnet hospitals

consistently reveals positive associations between favorable care environments and enhanced outcomes for both nurses and patients. While general literature reviews support the notion that improved nurse care environments are correlated with better patient outcomes, conclusive evidence has been somewhat elusive. Consequently, there remains skepticism among certain stakeholders regarding the true net impact of nurse practice environments on patient outcomes, particularly when accounting for patient-to-nurse staffing ratios. This debate holds practical significance for nurse leaders seeking strategies to enhance nurse retention and improve patient outcomes. (Kane et al., 2007)

This article seeks to empirically investigate whether superior hospital nurse care environments are independently linked to reduced patient mortality and improved nurse outcomes, after adjusting for nurse staffing levels and the educational qualifications of the registered nurse (RN) workforce in hospitals. Additionally, we aim to provide the inaugural empirical evidence regarding the association between the Practice Environment Scale of the Nursing Work Index (PES-NWI) – the chosen measurement tool – and national quality standards. (Estabrooks et al., 2005)

Methods

The data analyzed in this study were derived from a project that integrated hospital characteristics, patient outcomes, and surveys of nurses directly involved in patient care This study was notable for its inclusion of consistently collected survey data on nurse practice environments, a feature unavailable in other data sources. Moreover, the inclusive sampling approach ensured that hospitals could not selectively opt out, enhancing the generalizability of the findings. Approval for the study protocol was obtained

Samples

Hospitals:

The study encompassed 168 (80%) of the 210 adult acute care hospitals in during 1999. This hospital sample represented all facilities providing surgical care and employing a minimum of 40 nurses within the state. Criteria for inclusion comprised hospitals reporting 100 or more surgical discharges, having structural characteristics documented in the American Hospital Association Annual Survey or Pennsylvania Department of Health Hospital Questionnaire, and possessing sufficient nurse respondents to generate reliable estimates of survey-derived aggregate variables. On

average, each hospital had 60 nurse respondents, with over half having more than 50 respondents, and over 80% having more than 25 respondents.

Nurses:

A 50% random sample of registered nurses (RNs) residing in and registered to practice in received questionnaires at their homes in the spring of 1999. Responses were aggregated to the hospital level and linked with patient mortality data. Surveys were completed by over 40,000 nurses, representing a response rate of 52%. This rate compares favorably to other voluntary, anonymous surveys of health professionals. The resulting database, unusually large for survey research, provided a robust dataset. The demographic characteristics of the hospital nurses in this study were similar to those of hospital nurses in the National Sample Survey of Registered Nurses regarding age, working status, and education.

Patients:

The study analyzed outcomes for 232,342 patients aged 20 to 85 years who underwent general surgical, orthopedic, or vascular procedures in the 168 hospitals. Patient outcomes data were obtained from discharge abstracts provided by the Health Care Cost Containment Council. The study focused on patients undergoing common surgical procedures due to their prevalence across hospitals and the availability of well-developed risk adjustment methods for surgical outcomes.

Nurse Job Outcomes and Nurse-Rated Quality of Care:

Nurse survey measures included job satisfaction, burnout, intent to leave their jobs within the next year, and perceptions of quality of care. Burnout was assessed using the 9-item emotional exhaustion subscale of the Maslach Burnout Inventory, with a Cronbach's alpha of .92 in the current dataset.

Surgical Patient Outcomes and Characteristics:

Patient outcomes analyzed included deaths within 30 days of hospital admission and failure to rescue, defined as deaths within 30 days of admission among patients with complications. Patient risks were adjusted for various factors predictive of mortality and failure to rescue, including age, sex, transfer status, emergent admission, surgery type, preexisting conditions, and surgeon board certification status.

Adjustment for differences across hospitals in patients' baseline mortality risks was accomplished by controlling for 133 predictive variables, resulting in a mortality risk adjustment model with a C statistic of .89 and a failure-to-rescue model with a C statistic of .81.

Results

Based on the median cutoffs for hospital-level scores (refer to Table 1), of the 168 hospitals studied, 43 (26%) fell into the poor environment category, 83 (49%) were categorized as mixed, and 42 were classified as better. Regarding structural characteristics, 19% of the hospitals were large (more than 500 beds), 36% were teaching hospitals, and 28% were high-technology hospitals offering open-heart surgery, major organ transplants, or both. The average hospital-level staffing was 5.7 patients per nurse, with lower staffing observed in hospitals with poor care environments (6.0) compared to those with mixed (5.8) and better environments (5.3). The proportion of nurses with bachelor of science in nursing (BSN) degrees averaged 31% overall, with slightly lower percentages in hospitals with poor and mixed care environments (29% and 30%, respectively) compared to those with better environments (35%).

Regarding patient outcomes, 2% of surgical patients died within 30 days of admission, while 8% of patients who developed complications experienced failure to rescue.

Table 2 presents the distribution of nurse characteristics and nurse reports across hospital categories based on the practice environment. Higher percentages of nurses in hospitals with poor care environments reported high burnout levels and dissatisfaction with their jobs. Additionally, nurses in hospitals with poor care environments were more likely to report poor or fair quality of care and express lack of confidence in management's ability to address patient care problems.

The results of modeling the effects of care environments on nurse outcomes and nurse reports of quality of care, while controlling for nurse characteristics and patient clustering within hospitals, are displayed in Table 3. Care environments and nurse staffing had significant effects on burnout and job dissatisfaction, with better care environments associated with lower odds of these outcomes. Even after controlling for care environments, higher patient-to-nurse ratios were associated with increased odds of burnout and job dissatisfaction. Moreover, nurses in hospitals with better care environments were less likely to report concerns with patient care quality.

Table 4 demonstrates the associations between care environments, nurse staffing, nurse education, and patient outcomes such as 30-day mortality and failure to rescue. After adjusting for patient and hospital characteristics, hospitals with better care

environments were associated with a 14% lower likelihood of patients dying within 30 days of admission compared to hospitals with poor environments. Additionally, the odds of patients dying were lower in hospitals with higher proportions of BSN-prepared nurses. Direct standardization methods were used to estimate mortality and failure-to-rescue rates under different hypothetical conditions, indicating significant potential reductions in these outcomes with improvements in care environments, nurse staffing, and nurse education.

Overall, hospitals ranking poorly on all three factors (care environment, staffing, and nurse education) had substantially higher mortality and failure-to-rescue rates compared to hospitals performing well on all three measures.

Table 1: Properties of the Hospital-Level Practice Environment Scale of the Nursing Work Index Subscales

Subscale	No. of Items	Cronbach's α	Range	Mean (SD)	Median
Nursing Foundations for Quality of Care	7	0.74	1.2-2.8	2.2 (0.3)	2.2
Nurse Manager Ability, Leadership, and Support	4	0.82	1.3-3.0	2.4 (0.2)	2.4
Collegial Nurse/Physician Relations	3	0.80	2.2-3.2	2.8 (0.2)	2.8

Note: Scale scores range from 1 to 4, with higher scores indicating more positive work environments.

Table 2: Nurse Characteristics, Outcomes, Reports of Adverse Events, and Assessments of Patient Care Quality

Category	All	Poor	Mixed	Better
Total Nurses	10,184	2,237 (22.0)	4,752 (46.7)	3,195 (31.4)
Male	596 (5.9)	140 (6.3)	289 (6.2)	167 (5.3)
Years as Registered Nurse (mean ± SD)	13.8 ± 9.8	14.5 ± 10.0	14.0 ± 9.6	13.0 ± 9.8
Unit: Medical Surgery (n (%))	2,549 (25.0)	557 (24.9)	1,177 (24.8)	815 (25.5)
Unit: Intensive Care Unit (n (%))	1,863 (18.3)	382 (17.1)	868 (18.3)	613 (19.2)

Unit: Operating Room (n (%))	1,031 (10.1)	230 (10.3)	503 (10.6)	298 (9.3)
Unit: Other (n (%))	4,741 (46.6)	1,068 (47.7)	2,204 (46.4)	1,469 (46.0)
Nurse Outcomes				
High Burnout (n (%))	4,364 (43.2)	1,127 (50.8)	2,087 (44.3)	1,150 (36.3)
Job Dissatisfaction (n (%))	4,175 (41.6)	1,053 (47.9)	2,067 (44.1)	1,055 (33.5)
Intent to Leave (n (%))	2,312 (23.0)	521 (23.5)	1,134 (24.2)	657 (20.8)
Nurse's Assessments of Quality				
Report Quality of Nursing Care on their Unit as Poor or Fair (n (%))	1,308 (13.1)	425 (19.3)	626 (13.4)	257 (8.2)
Not Confident that Management will Resolve Patient Care Problems (n (%))	1,290 (13.0)	366 (16.7)	625 (13.6)	299 (9.7)
Not Confident that Patients can Manage their Care when Discharged (n (%))	2,986 (29.8)	905 (41.0)	1,429 (30.6)	652 (20.8)
Would Not Recommend Hospital to Family Member (n (%))	2,147 (21.8)	696 (32.3)	1,057 (23.0)	394 (12.7)

Note: Values are presented as n (%) unless otherwise indicated.

Table 3: Adjusted Odds Ratios (OR) Indicating the Effect of Better Versus Mixed (or of Mixed vs Poor) Care Environment and Nurse Staffing on Nurse Outcomes

Outcome and Effect	**Estimated Separately**	**Estimated Jointly**
Job Outcomes		
Burnout		
- Care environment	0.74 (0.68-0.80)a	0.76 (0.70-0.82)a
- Nurse staffing	1.21 (1.11-1.31)a	1.17 (1.09-1.25)a
Job dissatisfaction		
- Care environment	0.74 (0.67-0.80)a	0.75 (0.68-0.81)a
- Nurse staffing	1.15 (1.06-1.24)a	1.11 (1.04-1.18)a
Intent to leave within 1 year		

- Care environment	0.87 (0.78-0.96)a	0.87 (0.79-0.96)a
- Nurse staffing	1.05 (0.96-1.14)b	1.03 (0.95-1.12)b
Nurse Reports of Quality of Care		
Quality of nursing care is poor or fair		
- Care environment	0.60 (0.53-0.68)a	0.62 (0.55-0.69)a
- Nurse staffing	1.33 (1.23-2.01)a	1.27 (1.16-1.40)a
Not confident that management will resolve patient care problems		
- Care environment	0.62 (0.56-0.68)a	0.63 (0.57-0.68)a
- Nurse staffing	1.16 (1.05-1.29)c	1.11 (1.01-1.21)d
Not confident that patients can manage their care when discharged		
- Care environment	0.74 (0.66-0.84)a	0.76 (0.68-0.86)a
- Nurse staffing	1.22 (1.09-1.36)a	1.18 (1.06-1.31)a
Would not recommend hospital to family member		
- Care environment	0.55 (0.44-0.68)a	0.56 (0.45-0.70)a
- Nurse staffing	1.26 (1.04-1.52)d	1.19 (0.99-1.43)b

Abbreviation: CI, confidence interval.
a P < .01.
b P < .10.
c P < .001.
d P < .05.

Table 4: Adjusted Odds Ratios (OR) Indicating the Effect of Better Versus Mixed (or of Mixed vs Poor) Care Environment, Nurse Staffing, and Nurse Education on Mortality and Failure to Rescue

Outcome and Effect	Estimated Separately	Estimated Jointly
Mortality		
- Care environment	0.91 (0.85-0.97)a	0.93 (0.87-0.99)b
- Nurse staffing	1.08 (1.03-1.13)a	1.06 (1.01-1.11)a

- Nurse education	0.94 (0.90-0.97)a	0.96 (0.92-0.99)b
Failure to rescue		
- Care environment	0.91 (0.85-0.98)a	0.94 (0.88-1.00)c
- Nurse staffing	1.08 (1.03-1.13)a	1.06 (1.01-1.11)b
- Nurse education	0.93 (0.89-0.97)a	0.95 (0.91-1.00)b

Abbreviation: CI, confidence interval.

a P < .01.

b P < .05.

c P < .10.

Discussion

The findings of this study underscore the critical importance of nurse staffing levels and care environments in shaping patient outcomes. Surgical mortality rates were substantially higher in hospitals characterized by poor staffing and care environments compared to those with better conditions. Our extrapolation suggests that improvements in care environments, nurse staffing, and nurse education could potentially avert approximately 40,000 patient deaths annually nationwide. (Tourangeau et al., 2007)

However, it's important to interpret these estimates cautiously. Like many cross-sectional health services research projects, this study has limitations. Longitudinal data and consideration of other relevant variables could provide deeper insights and establish causal relationships between care environments and outcomes. While our data are from 1999, the enduring nature of the relationships observed suggests that the findings remain relevant. (Aiken et al., 2003)

Nurse leaders have several options for enhancing nurse retention and patient outcomes. Improving RN staffing, fostering a more educated nursing workforce, and enhancing the care environment are key strategies. Magnet hospitals serve as exemplary models, demonstrating how investments in staff development, quality management, and positive interprofessional relationships can lead to improved outcomes. Our study further highlights that each of these strategies independently contributes to better patient outcomes, suggesting that maximizing all three holds promise for achieving optimal results. (Lake & Friese, 2006)

In conclusion, addressing nurse staffing, education, and the care environment collectively represents a multifaceted approach to improving healthcare quality and patient safety. By investing in these areas, healthcare institutions can cultivate

environments conducive to both nurse well-being and enhanced patient outcomes. (Kazanjian et al., 2005)

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